Medical Education Original Article

Morgan Turnow*, DO, Minali Nemani, BS, Nithin Gupta, BS, Hayden Hartman, BS, Taylor Manes, DO, Tyler Williamson, DO and Arianna Gianakos, DO

Recent and future trends in osteopathic orthopedic surgery residency match rates following the transition to a single accreditation system

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Abstract

Context: Medical education in the United States has undergone significant changes, specifically within the osteopathic community. In 2020, a merger occurred between the American Osteopathic Association (AOA) and the Accreditation Council for Graduate Medical Education (ACGME), forming a single accreditation system (SAS) for graduate medical education and residency placement, with the purpose to create consistency within graduate medical education and to provide equal opportunities for applicants pursuing all specialties in medicine. However, osteopathic medical students, especially students applying to competitive residencies including orthopedic surgery, have faced challenges, raising concerns about future implications within this field.
Objectives: The main objective of this study aimed to investigate recent match rate trends in orthopedic surgery within the past 5 years and to forecast match trends for both allopathic and osteopathic students to further analyze the future projection of the orthopedic surgery match.
Methods: This study utilized publicly available data from the National Residency Match Program (NRMP) Main Residency Match data. Data were collected retrospectively from 2020 to 2024 regarding students applying for orthopedic surgery residency. The number of matched Doctor of Osteopathic Medicine (DO) applicants, Doctor of Medicine (MD) applicants, overall applicants, and the proportion of matched applicants being DOs were forecasted over the next 10 years utilizing an Autoregressive Integrated Moving Average (ARIMA) model in SPSS 29.0. This model harvests data from previous instances (number of matched applicants from 2008 to 2024) to develop a close-fit model to predict future values and their respective confidence intervals (CIs). This study incorporated all applicants applying to orthopedic surgery, including international medical graduates (IMGs).
Results: There was an increase in the total applicants applying to orthopedic surgery residency positions for both allopathic and osteopathic students. The largest increase in applicants occurred between the 2021 and 2022 application cycles. There was a statistically significant difference in the total number of applicants overall over the 2020–2024 match cycle. The percentage of DOs to match into an orthopedic surgery residency position decreased from 63.28 % in 2020 to 45.70 % in 2024, and there was a statistically significant decline in the match percentage of DOs in orthopedic surgery residency over the 2020–2024 match cycle. Based on the ARIMA model projection utilizing data from 2008 to 2024, there is expected to be an average increase of 14.1 % in the total number of positions offered by 2034, to 1,045 positions total. There is expected to be a moderate increase in the number of matched DO applicants, from 128 in 2024 to 161 in 2034. Utilizing data from 2016 to 2024, there is expected to be an average increase of 10.7 % in the total number of positions offered by 2034, leading to a decreased proportion of positions filled by DO applicants by 2034, from 14.0 % in 2024 to 12.2 % by 2034.

***Corresponding author: Morgan Turnow**, DO, Department of Orthopedic Surgery, Ohio Health Doctors Hospital, 5100 W. Broad Street, Columbus, OH, USA, E-mail: morgan.turnow@ohiohealth.com
Minali Nemani, BS, Edward Via College of Osteopathic Medicine, Monroe, LA, USA
Nithin Gupta, BS, Campbell University School of Osteopathic Medicine, Lillington, NC, USA
Hayden Hartman, BS, Lincoln Memorial University, DeBusk College of Osteopathic Medicine, Knoxville, TN, USA
Taylor Manes, DO, Department of Orthopedic Surgery, Ohio Health Doctors Hospital, Columbus, OH, USA
Tyler Williamson, DO, Department of Orthopedic Surgery, University of Texas Health San Antonio, San Antonio, TX, USA
Arianna Gianakos, DO, Department of Orthopedic Surgery, Yale Medicine, Orthopedics and Rehabilitation, New Haven, CT, USA

Conclusions: Osteopathic students continue to face challenges despite progress in DO representation within orthopedic surgery. We hope to provide insight into the growing competitiveness of orthopedic surgery programs and to describe future trends in DO match rates to aid students pursuing this field.

Keywords: education; match; orthopedic surgery; orthopedics; osteopathic; residency

The medical education landscape has observed an 81 % increase in the number of Doctors of Osteopathic Medicine (DO) and medical students over the past decade [1, 2]. Osteopathic medical students currently comprise approximately 25 % of all medical students in the United States across 42 different medical schools in 67 different locations [1, 2]. A demographic shift has been noted as 62 % of practicing DOs are under the age of 45, with nearly half being female, a positive contribution toward reaching gender parity among physicians [1]. Historically, DOs utilized the American Osteopathic Association (AOA) to match into residency positions. In 2020, a merger occurred between the AOA and the allopathic medical students' Accreditation Council for Graduate Medical Education (ACGME), forming a single accreditation system (SAS) for graduate medical education and residency placement [2, 3]. The intent of the merger was to create consistency within graduate medical education in both the application process and within residency training [3]. However, DOs have yet to match into surgical subspecialties, including orthopedic surgery, at the same rate as allopathic students (MDs), and the merger has had a significant impact on residency match rates within the DO community.

Orthopedic surgery has continued to be one of the most competitive specialties sought out by medical students with an increasing rate of applicants despite an associated increase in the number of positions [4]. The match rate on average for MD and DO students continues to decline each year. In 2019, there was a 73 % match rate for all orthopedic surgery applicants, compared to 61.3 % in 2024 [4]. This competitive specialty also notes lower match rates based on degree type, with DOs matching at 45.7 % and MDs at a rate of 72.0 % in the 2024 match cycle [5]. Multiple factors, including the incorporation of pass/fail board examinations, signaling an increase in applicants, and a lack of expanding residency positions, may account for the continued decline in match rates. Therefore, this study aims to investigate recent match rate trends in orthopedic surgery within the past 5 years. An additional aim of this study is to forecast match trends for both MD and DO students to further analyze the future projection of the orthopedic surgery match.

Methods

This study utilized publicly available data from the National Residency Match Program (NRMP) Main Residency Match data (Main page: https://www.nrmp.ortho/match-data-analytics/resdiency-data-reports/). Institutional Review Board (IRB) approval was not needed for this study. Data were collected from 2020 to 2024 regarding students applying for orthopedic surgery residency. A retrospective review was conducted on the NRMP annual report data. The data collected included the total number of orthopedic programs, residency positions offered, number of orthopedic osteopathic senior applicants, total orthopedic applicants, number of osteopathic senior applicants who matched into an orthopedic residency position, and number of total matches. The data also encompassed the total percent of incoming orthopedic residents who were osteopathic candidates and the overall match rate percentage for osteopathic applicants.

A statistical analysis was performed utilizing unpaired t tests to examine the differences in the number of programs, positions offered, number of DO senior applicants, non-DO applicants (MD or international medical graduate [IMG], as reported per the NRMP), total applicants, number of DO senior applicants who matched into a residency spot, number of total matches, percent filled by DO seniors, total percent of spots filled, and the percentage of DOs who matched with a program. Finally, the number of matched DO applicants, MD applicants, overall applicants, and the proportion of matched applicants being DOs was forecasted over the next 10 years (2025–2034) utilizing an Autoregressive Integrated Moving Average (ARIMA) model in SPSS 29.0. The ARIMA model harvests data from previous instances (number of matched applicants from 2008 to 2024) to develop a close-fit model to predict future values (2025–2034) and their respective confidence intervals (CIs), as seen in previously published orthopedic studies [6–8]. Statistical significance was defined as $p<0.05$. This study incorporated all applicants applying to orthopedic surgery, including IMGs.

Results

The trend from 2020 to 2024 looking at the number of total applicants applying for an orthopedic surgery residency position is shown below (Figure 1). Overall, there was an increase in the total applicants applying to orthopedic surgery residency positions for both non-DO and DO students, rising from 1,015 to 1,236 and 177 to 256, respectively. The

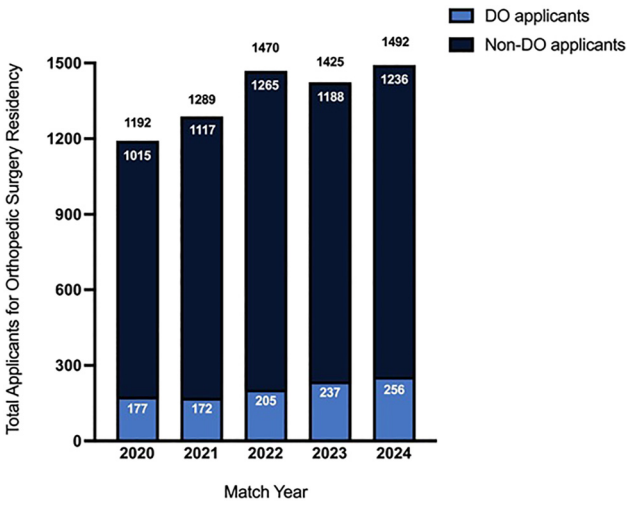

Figure 1: Bar graph showing the total number of applicants (doctor of osteopathic medicine [DO] and Non-DO) for the 2020–2024 application cycles.

Table 1: The percent differences from the 2020–2024 application cycles, change per year, and p value indicating significant or nonsignificant differences in the values over the 2020–2024 application cycles.

	Percent difference 2020-2024	Change per year (n or %)	p-Value
Number of programs	+7.1 %	+4.00	0.007
Positions offered	+7.6 %	+16.50	<0.001
Number of DO senior applicants	+36.5 %	+22.30	0.010
Non-DO applicants	+19.6 %	+51.30	0.985
Total applicants	+22.4 %	+73.60	0.0345
Number of DO senior applicants matched to a position	+4.4 %	+2.20	0.168
Number of total matches	+8.1 %	+17.50	< 0.001
Percent filled by DO seniors	−3.0 %	+0.01 %	0.947
Percent of DOs matched	−32.2 %	+0.12 %	0.003

[a]p<0.05 indicates statistical significance. DO, Doctor of Osteopathic Medicine.

largest increase in applicants occurred between the 2021 and 2022 application cycles. There was a decrease in the number of DO applicants in 2021 and non-DO (MD and IMG) applicants in 2023. There was a statistically significant difference in the total number of applicants overall over the 2020 to 2024 match cycle (p<0.05) (Table 1).

The number of orthopedic surgery residency programs have increased over the past 5 years, increasing from 203 in 2020 to 218 in 2024 (Figure 2A). There was no increase from 2023 to 2024 in the number of orthopedic surgery residency programs. There was a statistically significant difference in the number of orthopedic surgery residency programs over the 2020–2024 match cycle (p<0.05) (Table 1). Each year showed an increase in the total number of orthopedic surgery residency positions offered in the Match, increasing from 849 in 2020 to 916 in 2024 (Figure 2B). The largest jump in positions offered occurred between the 2022 and 2023 match cycle. There was a statistically significant difference in the number of orthopedic surgery residency positions offered over the 2020–2024 match cycle (p<0.05) (Table 1).

The total number of DO senior orthopedic surgery residents that matched has fluctuated throughout the 2020–2024 application cycles, and at a maximum, there were 119 total DO applicants who had matched out of the 237 DOs that applied, occurring in 2023 (Figure 3A). There was no statistically significant difference in the total US DO senior orthopedic surgery residency positions matched within the 2020–2024 application cycle (p>0.05) (Table 1). In 2021, DO applicants had the lowest match rate, with 107 total matched DO applicants out of the 172 DO applicants who applied. Additionally, the percentage of DOs to match into an orthopedic surgery residency position decreased from 63.3 % in 2020 to 45.7 % in 2024, and the match rate has decreased each year, with the largest drop occurring from 2021 to 2022 (Figure 3B). There was a statistically significant difference in the match percentage of DOs in orthopedic surgery residency over the 2020–2024 match cycle (p<0.05) (Table 1).

Based on the ARIMA projection model utilizing data from 2008 to 2024, there is expected to be an average increase of 14.1 % in the total number of positions offered by 2034, to 1,045 positions total (95 % CI 980–1,110; Figure 4A), along with a similarly associated increase in matched non-DO applicants from 779 to 864 (19.9 %; 95 % CI 843–884, r^2=0.734; Figure 4B). There is expected to be an increase in the number of matched DO applicants, from 128 in 2024 to 161 in 2034 (25.6 %; 95 % CI 113–209, r^2=0.000; Figure 4C) with a relatively larger CI. This promotes the idea that a sustained proportion of total positions will be filled by DO applicants through 2034, from 14.0 % in 2024 to 13.9 % by 2034 (−0.1 %; 95 % CI 9.9–18.0 %, r^2=0.023; Figure 4D).

Based on the ARIMA projection model utilizing data from 2016 to 2024, there is expected to be an average increase of 10.7 % in the total number of positions offered by 2034, to 1,014 positions total (95 % CI 924–1,103; Figure 5A), along with a similarly associated increase in matched MD applicants from 779 to 854 (9.6 %; 95 % CI 830–879, r^2=0.745; Figure 5B). When only utilizing data from 2016 to 2024, there is expected to be no increase in the number of matched DO applicants, from 128 in 2024 to 122 in 2034 (0 %; 95 % CI 112–132, r^2=0.000; Figure 5C). This leads to a decreased proportion of positions filled by DO applicants by 2034, from 14.0 % in 2024 to 12.2 % by 2034 (−1.8 %; 95 % CI 11.0–13.4 %, r^2=0.721; Figure 5D).

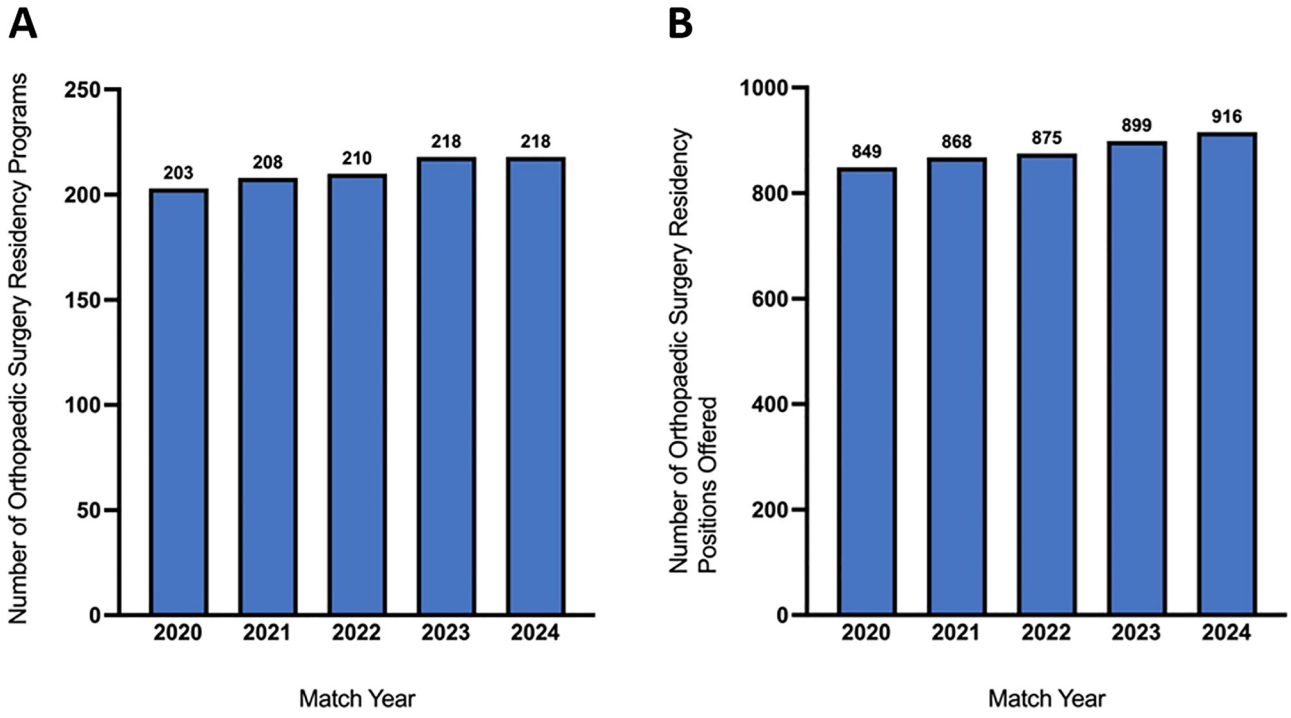

Figure 2: Bar graphs demonstrating residency program and residency positions offered from 2020–2024. (A) The total number of orthopedic surgery residency programs and (B) the number of orthopedic surgery residency positions offered.

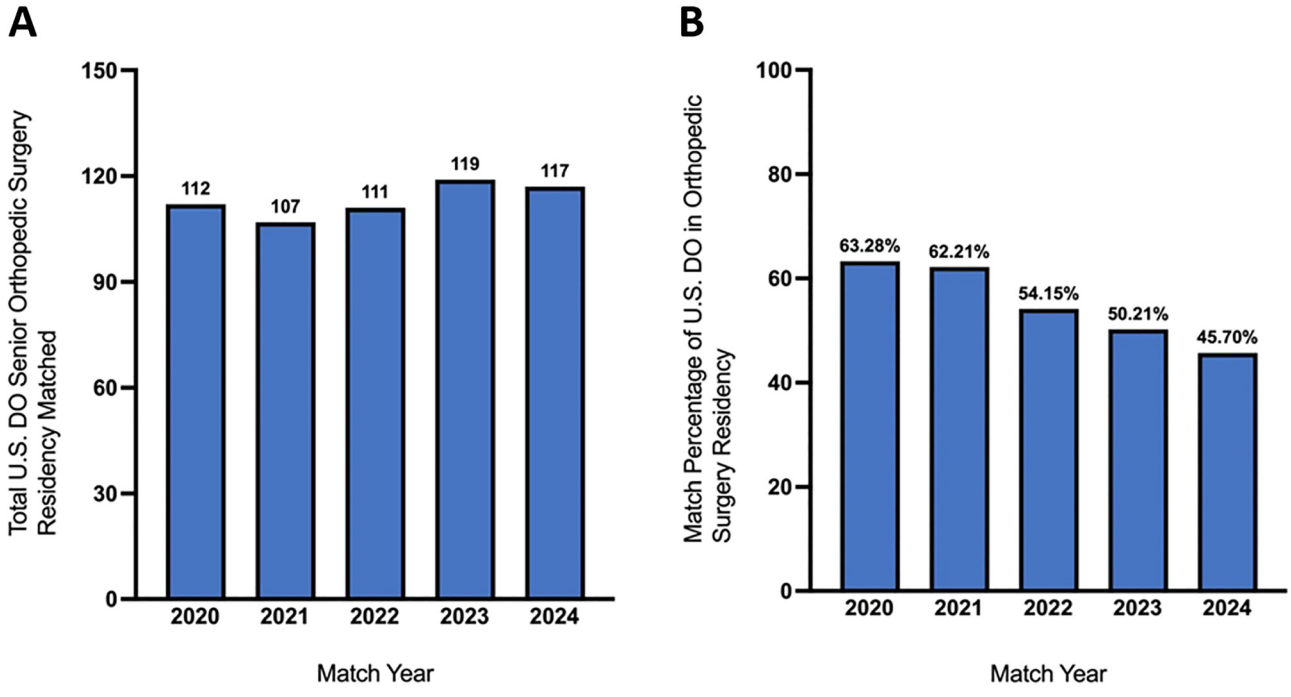

Figure 3: Bar graphs demonstrating the total DO applicants matched and percent total matched from 2020–2024. (A) The total number US DO senior orthopedic surgery residents matched and (B) the match percentage of US DOs in orthopedic surgery residency.

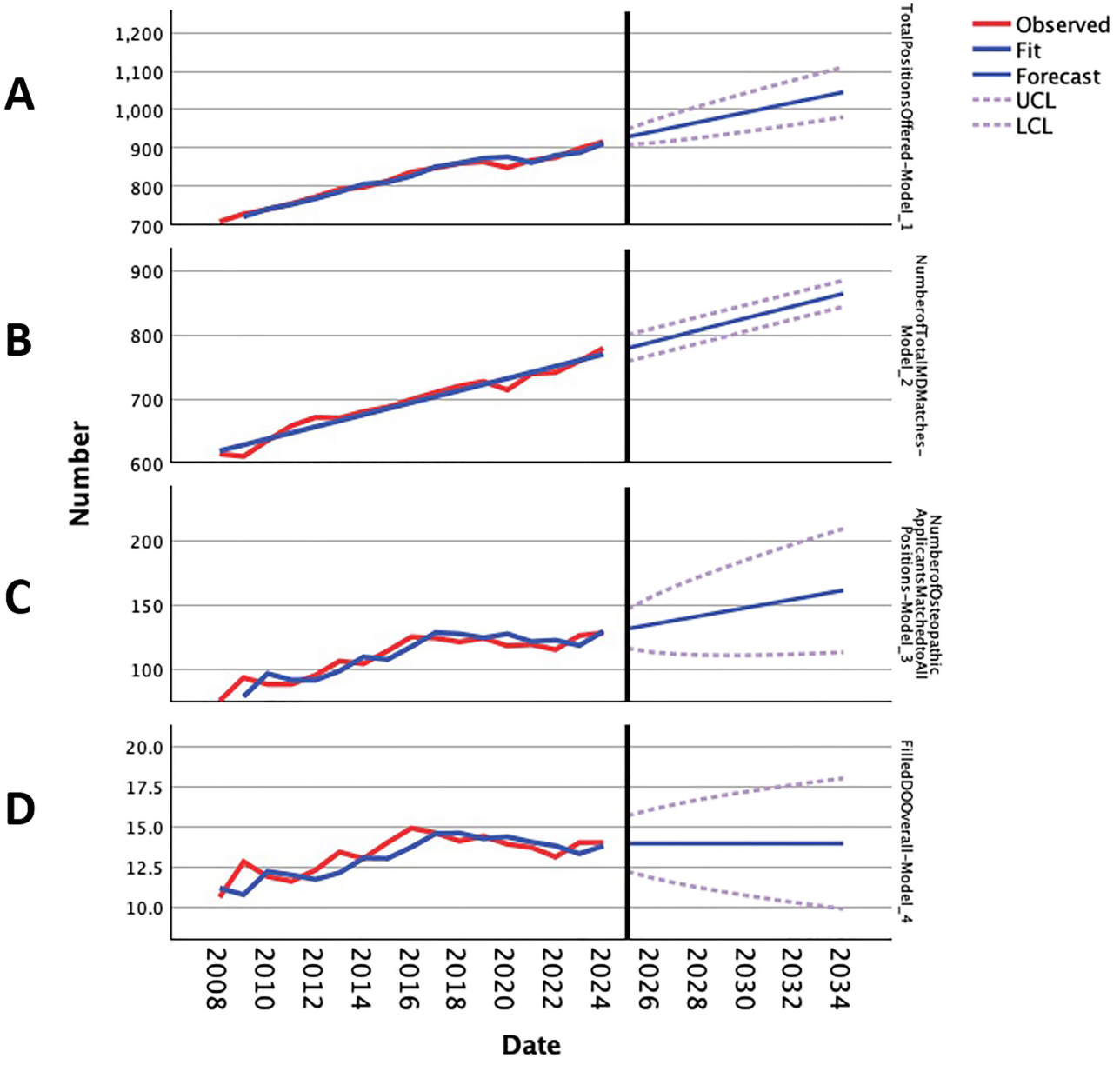

Figure 4: Line graphs demonstrating: (A) The total number orthopedic surgery positions offered. (B) The number of MD applicants matched. (C) The number of DO applicants matched. (D) The proportion of positions filled with DO applicants.

Discussion

This study sought to discuss recent match rate trends within the past 5 years and predictions through 2034. The main findings reveal that while there is an increase in the number of orthopedic surgery residency positions offered, the percentage of DOs who match continues to decline each year, with 2024 noting the lowest match rate yet (45.7 %). Forecasting through 2034 utilizing the ARIMA projection model suggests a moderate increase in the number of DOs who match into an orthopedic surgery position. However, the proportion of positions filled by DO applicants is expected to remain stagnant or decline, which raises concern and a priority to investigate potential reasons for this phenomenon.

Despite a 33 % increase in DO orthopedic surgery residents from 2010 to 2020, there remains a large difference in osteopathic vs. allopathic presence within this field [9]. This increase in osteopathic orthopedic residents does not seem to have greatly influenced overall match trends for DO senior applicants, with an increase from 112 to 117 over the

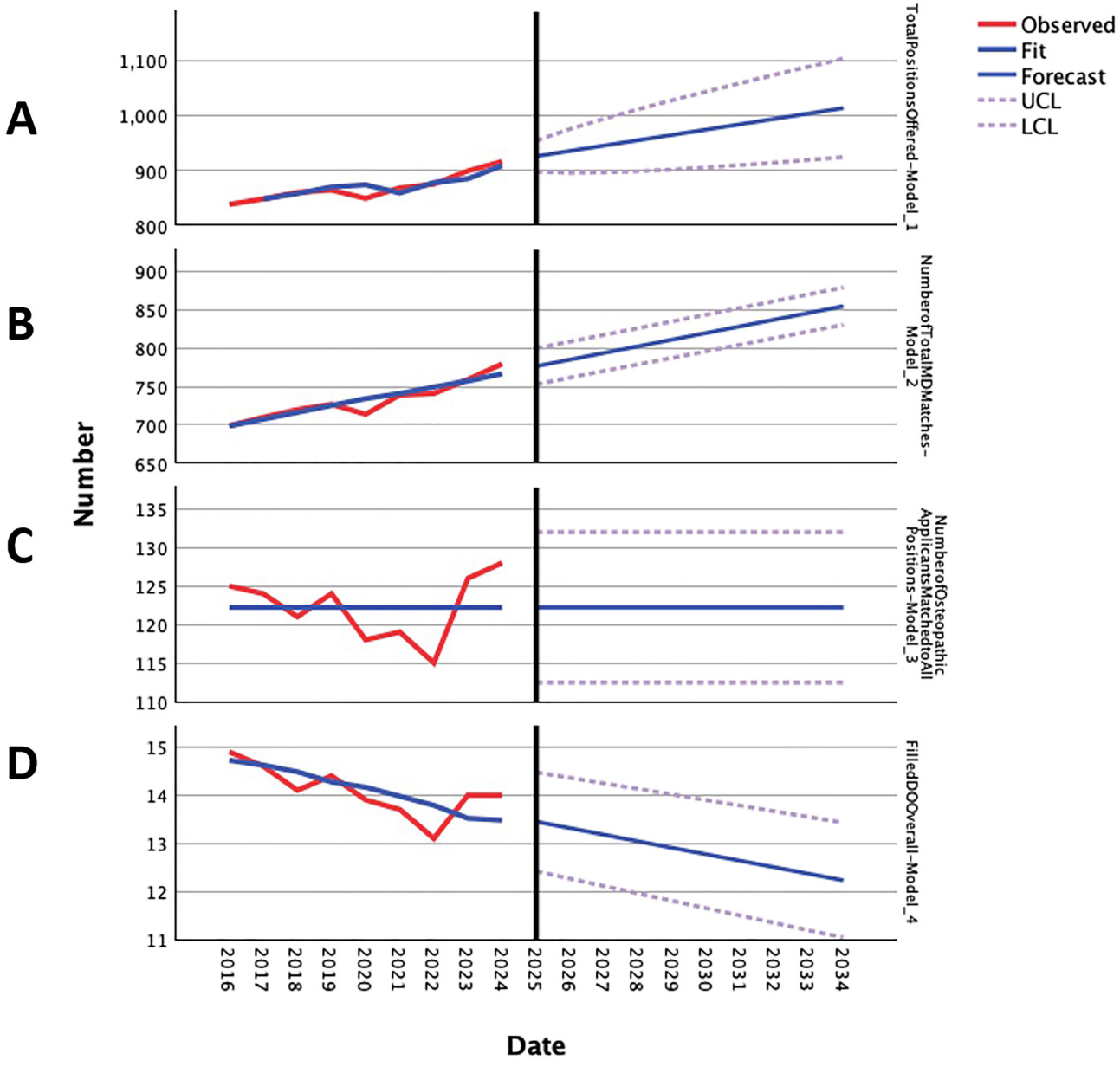

Figure 5: Line graphs demonstrating: (A) The total number of orthopedic surgery positions offered. (B) The number of MD applicants matched. (C) The number of DO applicants matched. (D) The proportion of positions filled with DO applicants.

span of 2020–2024, an increase of 4.3 %. Furthermore, when forecasting this data over the next 10 years, the most hopeful analysis demonstrates this rate remaining stagnant whereas more recent data projects a future decrease in DO representation within orthopedic surgery residency programs.

The DO senior match rate in orthopedic surgery has demonstrated a statistically significant ($p<0.01$) decrease from 2020 to 2024 [5]. This steady decline, despite the rising number of programs, positions, and DO applicants, draws attention to the difficulty that DOs may face in future match cycles. Although the number of DO senior applicants had a significant ($p<0.01$) increase in applicants in orthopedic surgery, there was not a statistically significant change in non-DO applicants from 2020 to 2024. Additionally, the applicant pool growth for DO candidates is far outpacing the creation of new residency positions. DO applicants' match rates will persistently decline if the number of applicants continue to rise without seeing an increase in their match rate to remedy the differences between osteopathic and allopathic representation in orthopedic surgery residency programs.

While these data cover the match climate immediately after the implementation of the SAS in 2020, DO medical students no longer have the protected 100+ orthopedic surgery residency spots previously available in the AOA match and must apply for positions available to other degree types [10]. With the SAS, US MD and IMG applicants may now match into programs that were traditionally under AOA, thus contributing to the lower DO senior match rate each year. A consequence of this merger for DO students is that segregation within the match starkly remains: in 2021, 1.1 % of residents in traditionally allopathic residency programs were DOs, yet 2.4 % of those in traditionally osteopathic programs were MDs. These statistics demonstrate that stigma continues to permeate the orthopedic surgery match [11]. This is further emphasized when placed in the current context of the orthopedic workforce shortage, in which the Health Resources and Services Administration (HRSA) estimates that there will be a deficit of more than 5,000 orthopedic surgeons across the United States in 2025 to fulfill the current need [12, 13]. Therefore, it may be in the best interest of institutions and healthcare corporations to invest in the future workforce by way of residency positions in order to narrow this gap and increase the access to care for patients, especially in underserved areas.

Historically, DO applicants took a numerically scored standardized examination, including the Comprehensive Osteopathic Medical Licensing Examination (COMLEX Level 1) with an option to also take the United States Medical Licensing Examination (USMLE Step 1). These examinations previously held considerable weight in the residency selection process, with 83 % of orthopedic surgery program directors stating that they utilized scores as an application screening tool [14]. Previously, matched orthopedic surgery applicants held the third highest mean examination score of all specialties (orthopedics: 248; plastic surgery: 249; dermatology: 249) [14]. However, in 2020, the National Board of Osteopathic Medical Examiners (NBOME) and National Board of Medical Examiners (NBME) announced that these scores would be transitioned to a pass/fail system rather than a three-digit score beginning in 2022. This change has the potential to significantly impact students within the 2024 match and beyond, especially those applying to competitive specialties, such as orthopedic surgery. Without an objective 3-digit board score, it is believed that resident selection committees will begin to focus on other criteria to evaluate applicants. Gu et al. [4] surveyed 53 orthopedic surgery program directors on the importance of various factors for interview selections and the perceived effect of the pass/fail examination format. Most program directors (65.8 %) responded that a numerically scored examination is either very or extremely important when selecting applicants for an interview, while 11.3 % of PDs considered the examination of similar importance. Other factors, including audition rotations, USMLE Step 2/COMLEX Level 2, and prior knowledge of the applicant will be the most important factors in considering interviewing candidates for an orthopedic surgery residency position [4, 15]. Additionally, a recent study compared Orthopedic In-Training Examination (OITE) scores between MD and DO orthopedic surgery residents. This study showed that DOs outperformed MD residents during the first year of residency and held comparable scores throughout the additional 4 years of training, demonstrating equivocal knowledge bases between DO and MD orthopedic surgery residents [16].

Research participation has quadrupled from 2003 to 2022 for orthopedic surgery applicants, with an average of up to 14 publications [17]. It is expected that research will continue to mount in importance for residency match success, although this presents a challenge for DO applicants because 12 % of osteopathic schools report receiving outside funding to conduct research and 76.8 % of DO students describe barriers in obtaining research opportunities [18, 19].

Other factors may explain the continued low rate of osteopathic students matching into orthopedic surgery. In 2022, the Association of American Medical Colleges (AAMC) introduced the preference signaling program, which allows applicants in orthopedic surgery to “signal” 30 programs to indicate high interest in the specific program [20]. This program was implemented due to the increase in orthopedic surgery residency applicants over time to achieve a peak ratio of 1.68 applicants to available positions in 2022 by the American Orthopaedic Association’s Council of Orthopaedic Residency Directors (CORD) [21]. Sorenson et al. [20] conducted a survey demonstrating that 86 % of programs through signaling was an important factor in deciding who to interview, and applicants were over 26 times more likely to receive an interview at a program they signaled vs. a program they did not. These changes were implemented for 2023 to give people a better chance at receiving an interview; however, the match rate continues to decrease for DO candidates. Although the objective number of the US DO senior matches increased the year that the 30 program signals system was implemented, their match percentage continued to decrease from 54.2 % in 2022 to 50.2 % in 2023 and 45.7 % in 2024.

With the COMLEX Level 1 and USMLE Step 1 being converted to a pass/fail system, we hypothesized that this would cause an influx of students applying to competitive surgical specialties compared to primary care specialties. The findings in the current study support this demonstrating a significant increase in the number of DO applicants

coupled with the lowest match rate for DO seniors thus far. Because examination scores are not publicly available, the two cannot be correlated. However, it is postulated that students may opt to pursue orthopedic surgery without a "competitive" score given that the USMLE Step 2 and COMLEX Level 2 are taken at the end of the third year of medical school, a time exceedingly past when specialty decisions have typically already been made. This highlights the importance for DO prospective applicants to look to the aforementioned factors, such as audition rotations, personal relationships, and research, that are now higher priority for program directors.

There are several limitations to this study. The data were collected from a publicly available source and is subject to data entry errors. The ARIMA model has inherent limitations including, but not limited to, the inability to account for future events (policy change, residency application changes, admittance format changes, funding sources, and so on) that may alter the rate of matching for all types of applicants, a limited time series (2008–2024) with which to test and predict from, as well as the use of a linear regression model to fit data that may be better suited by a different type of regression.

This authorship recommends honest and critical application review and advisement from orthopedic surgical mentors in the form of senior surgeons and experienced residents, as well as education of medical school advisors with updated recommendations, to provide strategic insight into each applicant's chances of matching and plan for rotations/residency applications/signaling/dual applying. In turn, these vigilant critiques may better inform future applicants of their match likelihood to contrive a suitable application plan.

Conclusions

Despite progress in osteopathic representation within orthopedic surgery, this study highlights enduring challenges that DO candidates continue to face. We hope to provide insight into the growing competitiveness of orthopedic surgery programs and to provide future DO applicants with additional information on how to be successful during the match process.

Research ethics: The local Institutional Review Board deemed the study exempt from review.
Informed consent: Not applicable.
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Conflict of interests: None declared.
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Data availability: Not applicable.

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